Precalc Warm Up # 10-1

1. Find the 80th term in 12, 15, 18, ...

2. Solve: $2^x = 16$

3. factor & simplify:

$$\frac{2-x}{x^2-4x+4}$$

From Friday:

Arithmetic sequences (AP) have a
CONSTANT DIFFERENCE, d.

The nth term is given by the following formula.

$$a_n = a_1 + d(n-1)$$

term #

a_n: n^{th} term; $t(n)$, outcome; u_n

a_1: first term.

d: common difference (Slope)

$$t(n) = dn + (\text{zero term})$$

$$y = mx + b$$

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EXERCISES 8.1.1

1. (a) Show that the following sequences are arithmetic.
(b) Find the common difference.
(c) Define the rule that gives the nth term of the sequence.

i. $\{2, 6, 10, 14, \ldots\}$
ii. $\{20, 17, 14, 11, \ldots\}$
iii. $\{1, -4, -9, \ldots\}$
iv. $\{0.5, 1.0, 1.5, 2.0, \ldots\}$
v. $\{y + 1, y + 3, y + 5, \ldots\}$
vi. $\{x + 2, x, x - 2, \ldots\}$

2. Find the 10th term of the sequence whose first four terms are $8, 4, 0, -4$.

3. Find the value of x and y in the arithmetic sequence $\{5, x, 13, y, \ldots\}$.

4. An arithmetic sequence has 12 as its first term and a common difference of -5. Find its 12th term.

5. An arithmetic sequence has –20 as its first term and a common difference of 3. Find its 10th term.

6. The 14th term of an arithmetic sequence is 100. If the first term is 9, find the common difference.

7. The 10th term of an arithmetic sequence is –40. If the first term is 5, find the common difference.

6) $a_{14} = 100$ $a_1 = 9$

$100 = 9 + d(14-1)$

8. If $n+5$, $2n+1$ and $4n-3$ are three consecutive terms of an arithmetic sequences, find n.

9. The first three terms of an arithmetic sequence are 1, 6, 11.
(a) Find the 9th term.
(b) Which term will equal 151?

10. Find x and y given that $4-\sqrt{3}$, x, y and $2\sqrt{3}-2$ are the first four terms of an arithmetic sequence.

8) $n+5$, $2n+1$, $4n-3$

use: common difference = common difference

$2n+1-(n+5) = 4n-3-(2n+1)$

$n =$

8. If $n+5, 2n+1$ and $4n-3$ are three consecutive terms of an arithmetic sequences, find n.

9. The first three terms of an arithmetic sequence are $1, 6, 11$.

(a) Find the 9th term.

(b) Which term will equal 151?

10. Find x and y given that $4-\sqrt{3}$, x, y and $2\sqrt{3}-2$ are the first four terms of an arithmetic sequence.

$$4-\sqrt{3}+3d = 2\sqrt{3}-2$$

$$\frac{3d}{3} = \frac{3\sqrt{3}}{3} - \frac{6}{3}$$

$$d = \sqrt{3}-2$$

11. For each of the following sequences

(a) $u_n = -5+2n, n \geq 1.$ (b) $u_n = 3+4(n+1), n \geq 1.$

determine

i. its common difference

ii. its first term

12. The third and fifth terms of an A.P are $x+y$ and $x-y$ respectively. Find the 12th term.

1 | 3 | 5

$-2d$ $+2d$

$$x+y+2d = x-y$$

$$-x-y \qquad -x-y$$

$$2d = -2y$$

$$d = -y$$

$$x+y-2(-y) = a_1$$

$$\vdots$$

$$a_1 =$$

$$a_{12} = a_1 + (-y)(11)$$

13. The sum of the fifth term and twice the third of an arithmetic sequence equals the twelth term. If the seventh term is 25 find an expression for the general term, u_n.

14. see next page For a given arithmetic sequence, $u_n = m$ and $u_m = n$. Find

(a) the common difference.

(b) u_{n+m}.

13) You can get 2 equations in a_1 and d

#1: $a_5 + 2a_3 = a_{12}$ and #2: $a_7 = 25$

$a_1 + d(7-1) = 25$

$a_1 + d(5-1) + 2[a_1 + d(3-1)] = a_1 + d(12-1)$

#2 $a_1 + 6d = 25$

$3a_1 + 8d = a_1 + 11d$

#1 $2a_1 - 3d = 0$

Now solve the system: $2(\#1) \rightarrow 4a_1 - 6d = 0$

$+ (\#2) \rightarrow a_1 + 6d = 25$

$5a_1 = 25$

$a_1 = 5$

Now plug in to find d...

13. The sum of the fifth term and twice the third of an arithmetic sequence equals the twelth term. If the seventh term is 25 find an expression for the general term, u_n.

14. For a given arithmetic sequence, $u_n = m$ and $u_m = n$. Find

(a) the common difference.

(b) u_{n+m}.

a) $m = a_1 + d(n-1)$ and $n = a_1 + d(m-1)$

Solve system equation #1 - #2: $m = a_1 + dn - d$

$-(n = a_1 + dm - d)$

$m - n = dn - dm$

$\frac{-(m+n)}{n-m} = \frac{d(n-m)}{(n-m)}$

$\boxed{-1 = d}$

b) $a_{(n+m)} = a_1 + (-1)(n+m-1)$ Need a_1

from part a) $\rightarrow m = a_1 + (-1)(n-1)$

$m = a_1 - n + 1$

$a_1 = m + n - 1$

$a_{(n+m)} = m+n-1 + (-1)(n+m-1)$

$= m + n - 1 - n - m + 1$

$a_{(n+m)} = 0$

In groups, try to come up with an easy way to do this problem. A little boy named Gauss did. He was sent to the corner because he was misbehaving and told he couldn't come out until he had the answer. It took him only a few seconds, and he didn't have a calculator!

$1 + 2 + 3 + \ldots + 98 + 99 + 100 = 5050$

$+100$ $+99$ $+98$ $\quad\ldots\quad$ $+3$ $+2$ $+1$

101 101 101 $\quad\ldots\quad$ 101 101 101

$$\frac{100(101)}{2} \rightarrow 50(101)$$

$$S_n = \frac{n(a_1 + a_n)}{2}$$

$3+5+7+\ldots+81+83+85 \rightarrow n?$

How many terms are being added?

$$a_n = a_1 + d(n-1)$$

$$85 = 3 + 2(n-1)$$

$$n = 42$$

Find the sum $S_{42} = \frac{42(3+85)}{2}$

$= 1848$

Arithmetic SERIES: the sum of the terms in a sequence.

$$S_n = \frac{n}{2}(a_1 + a_n)$$

$$\frac{n}{2}(a_1 + a_1 + d(n-1))$$

$$S_n = \frac{n}{2}(2a_1 + d(n-1))$$

Groups:

Find the sum of the first 76 odd numbers (starting at 1)

Groups:

$d = 2$

Find the sum of the first 76 odd numbers (starting at 1)

$$S_n = \frac{n}{2}[2a_1 + d(n-1)]$$

$$S_{76} = \frac{76}{2}[2 + 2(76-1)]$$

$$S_{76} = 5776$$

Find the sum of first 30 terms in

-3 + -13 + -23 + -33 + ...

$$S_n = \frac{n}{2}[2a_1 + d(n-1)]$$

$$S_{30} = \frac{30}{2}[2(-3) - 10(30-1)]$$

$$S_{30} = 15(-6 - 290)$$

$$S_{30} = -4440$$

In an arithmetic series, if the 5th term is 2 and the sum of the first 10 terms is 5, find the first term, the constant difference, and the sum of the first 100 terms.

$a_5 = 2$

$2 = a_1 + d(5-1)$

$2 = a_1 + 4d$

$S_{10} = 5$

$5 = \frac{10}{2}[2a_1 + d(10-1)]$

$2a_1 + 9d = 1$

Now solve the system!

$a_1 = 14, \quad d = -3, \quad S_{100} = -13450$

Remember solving with logs

Natural Log: ln

To solve: $2^x = 5$

$\log_e \rightarrow e$ is the natural base

$\ln 2^x = \ln 5$ take ln both sides

$x(\ln 2) = \ln 5$ Move the exponent out in front as a multiplier.

$x = \frac{\ln 5}{\ln 2}$ ← ÷ both sides by $\ln 2$

$x \approx 2.32$ calculate and state approximation.

Solving by graphing and finding an intersection.

$2^x = 0.5x + 3$; for $x > 0$

enter $y = 2^x$

$y = 0.5x + 3$

Set standard window

ZOOM choose: 6 Standard.

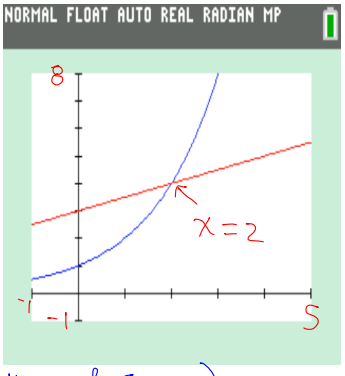
2nd Calculate

TRACE → choose: intersect

Use ◀ to move cursor on left side of intersection then press enter to set it.

Use ▶ to move cursor to rt. side of intersection & press enter to set it.

Press enter a couple times to get the answer (at bottom of screen)



HW: SL Book

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See what you remember about logs ... try #7.